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Time contracts when the mind wanders

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Abstract

Mind-wandering refers to the act of engaging in task-unrelated thoughts. Mind-wandering is known to impact a wide array of cognitive functions but whether and how it affects time perception is unknown. We expected that allocation of attention to task-unrelated thoughts during interval timing would have the consequence of reduced attention to, and a concomitant perceived contraction of, timed intervals. Thirty-four participants completed a sub-second visual oddball task in which infrequent stimuli of varying duration were embedded within a train of homogeneous standard stimuli of constant duration. Participants judged whether the oddball was shorter or longer in duration than the standards and whether their attention was “on-task” (focused on the task) or “off-task” (directed toward task-unrelated thoughts or the non-task environment) during the stimulus train. Individual participants’ probabilities of a long response $p(\text{long})$ at each oddball interval were fitted with logistic functions separately for on-task and off-task trials. The oddball duration corresponding to the 50% threshold on the psychometric function ($t(p(\text{long}) = 0.5)$; the point of subjective equality [PSE]) was used as a measure of perceived duration whereas the Weber fraction (WF), which is the difference limen $[(t(p(\text{long}) = 0.75) - t(p(\text{long}) = 0.25))/2]$ standardized by the PSE, was used as a measure of temporal precision. Participants reported being off-task in 18% of trials. As predicted, they exhibited larger PSEs, reflecting greater underestimation of oddball intervals, when off-task than when on-task. This effect was robust with 81% of participants displaying temporal contraction during off-task trials. The magnitude of change in PSEs during off-task states was unrelated to the frequency of off-task state reports, finger-response patterns, or participants’ awareness of an association between being off-task and pressing short (as assessed in a post-experiment debriefing session). Participants also exhibited a reduction in temporal precision when mind-wandering, as reflected in larger WFs for off-task than on-task trials. These results demonstrate that mind-wandering is associated with a perceived contraction of temporal intervals.

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